Review of postoperative outcomes from the Bi-National Colorectal Cancer Audit on screened versus non-screened patients

Farhad Salimi, PhD
Registry Science and Research, School of Population Health and Preventive Medicine

20 Nov 2019
8th Annual NHMRC Symposium on Research Translation
Background

The Australian National Bowel Cancer Screening Program (NBCSP)

- In Australia, colorectal cancer is the second most commonly diagnosed cancer and one of the most common causes of cancer-related death
- The NBCSP using faecal occult blood testing (FOBT) was introduced in 2006
- The program has been rolled out in a staged manner reflecting increasing government support and funding
- The eligible population increased from those aged 55 or 65 years in 2006 to full implementation of biennial screening for all Australians aged 50-74 by 2020
- A recent review of the NBCSP found that compared to non-invitees, invitees had a lower risk of death from colorectal cancer and were more likely to be diagnosed at an earlier stage

- The impact of FOBT screening on other cancer-related health outcomes, such as morbidity and mortality associated with colorectal cancer surgery, has however been less examined
Background

The Bi-national Colorectal Cancer Audit (BCCA)

- Since 2007, the BCCA has collected information about the diagnosis, management, and outcomes of surgically managed Australian and New Zealand patients with colorectal cancer

- The BCCA captures approximately 15% of newly diagnosed colorectal cancers in Australia and New Zealand each year

- Additionally, data on participation in the National Bowel Cancer Screening Program is collected

- The BCCA could provide valuable insights into the impact of screening on postoperative outcomes in surgically managed colorectal cancer patients
Aim

To determine whether patients with surgically managed colon and rectal cancer, diagnosed after participation in the NBCSP have better short-term postoperative outcomes compared to those diagnosed through other means.
Methods

Study population

- Australian adult patients aged 18 years or over, who had undergone colorectal cancer surgery from January 2007 to December 2018
- New Zealand patients were excluded because a national screening program did not start until 2018
- Patients were excluded from the analysis if their cancer type was not specified as colon or rectal cancer, or if there was no information about their screening status
Methods

Outcomes

1. Postoperative mortality (≤ 30 day mortality or inpatient death)
2. Surgical complications (which included abdominal/pelvic collection, anastomotic leak, enterocutaneous fistula, wound dehiscence, wound infection, sepsis, ileus, obstruction, urinary retention, ureteric injury, splenectomy, postop haemorrhage, other)
3. Medical complications (included chest infection, deep vein thrombosis and pulmonary embolus, other)
4. Returned to theatre
5. Length of stay (calculated from surgery date and discharge date)
Methods

Statistical analysis

- Binary logistic regression models were used to assess the associations between screening and binary outcomes (i.e. postoperative mortality, surgical complication, medical complications and return to theatre)
- The association with length of stay was assessed using ordinary least squares linear regression models
Methods

Statistical analysis

• We developed the models in three steps:
  1. Unadjusted model
  2. Model 1: Adjusted for age (5 year groups), sex, ASA score (low risk vs high risk), area level SES (quintiles), and cancer type (colon vs rectal)
  3. Model 2: Model 1 plus tumour stages (0, I, II, III, VI, and X), surgical type (open vs minimally invasive surgery), and urgency of surgery (elective, urgent, or emergency)

• These models were decided on the basis of previous studies and the availability of data

• Model 1 included the variables which are independent of screening

• Model 2 added the variables which may be affected by screening and are on the causal pathway from screening to outcome.

• We chose Model 1 as the main model since Model 2 is likely to be overadjusted. However, Model 2 is presented so results can be compared to other studies with similar variables.
Methods

Statistical analysis

• Potential effect modifications by age group, sex and cancer type were evaluated by including interaction terms in the main model (Model 1)

• Sensitivity analyses:
  1. Main model (model 1) was further adjusted for year of surgery (categorical variable) to account for potential changes in surgical methods (e.g. increasing use of laparoscopic surgery in recent years)
  2. Participants whose tumours were detected by positive FOBT were excluded from the non-screened group.
Results

Total number of colorectal cancer cases in database
n=23,920

EXCLUDED (n = 12,627)
- Diagnosis not specified as colon or rectal cancer (n = 610)
- Screening status unknown (n = 7,547)
- Unknown adjusting variables and/or outcomes (n = 4,470)

Total included in the analysis
n = 11,293 (47%)

Non-screened
n = 10,453 (92%)

National bowel cancer screening program
n = 840 (7%)
Results

- Screened patients were more likely to be: younger, male, have a lower risk ASA score, be of lower SES, present for elective surgery, have a less-advanced cancer stage, and undergo minimally invasive surgery.

- There was no difference in cancer type (colon vs rectal) between screened vs non-screened patients.
## Results

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Univariable regression</th>
<th>Multivariable regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crude Model</td>
<td>Model 1*</td>
</tr>
<tr>
<td>Outcome</td>
<td>OR (95% CI)</td>
<td>p-value</td>
</tr>
<tr>
<td>Mortality</td>
<td>0.14 (0.02, 0.44)</td>
<td>0.01</td>
</tr>
<tr>
<td>Surgical complications</td>
<td>0.82 (0.69, 0.97)</td>
<td>0.02</td>
</tr>
<tr>
<td>Medical complications</td>
<td>0.54 (0.43, 0.67)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Returned to theatre</td>
<td>0.99 (0.73, 1.34)</td>
<td>0.92</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Univariable regression</th>
<th>Multivariable regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crude Model</td>
<td>Model 1*</td>
</tr>
<tr>
<td>Outcome</td>
<td>Mean diff (95% CI)</td>
<td>p-value</td>
</tr>
<tr>
<td>Length of stay (d)</td>
<td>-2.34 (-2.90, -1.79)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

*Adjusted for age, sex, SES, screen category, cancer type, ASA
†Adjusted for age, sex, SES, screen category, cancer type, operative approach, urgency of surgery, overall stage, ASA
Results

Modifying effects of cancer type, patient age and sex:

None of the interaction terms were statistically significant ($p > 0.05$), therefore, there was no evidence that cancer type, age group or sex modifies the effects of screening on any of the outcomes.

Sensitivity analyses:

Removal of FOBT detected (but not NBSCP detected) colorectal cancers and adjusting for year of surgery did not change the results significantly.
Conclusions

- Our findings add to the evidence of the impact of colorectal cancer screening on short-term postoperative outcomes

- Importance of considering all quality of life for patients when implementing a national screening program

- Evidence of reduction in postoperative complications associated with participation in national screening adds to the program’s health economic benefits

- We highlighted the importance of avoiding overadjustment in statistical modelling
Thank you

Farhad.Salimi@monash.edu